

*Casuarina equisetifolia*   简体中文  正體中文

**System:** Terrestrial

| Kingdom | Phylum        | Class         | Order        | Family        |
|---------|---------------|---------------|--------------|---------------|
| Plantae | Magnoliophyta | Magnoliopsida | Casuarinales | Casuarinaceae |

**Common name** arbol de hierro (Spanish, Galapagos), Australian beefwood (English), agoho (English, Philippines), pino australiano (English, Puerto Rico), nokonoko (English, Fiji), beef wood-tree (English), beach she-oak (English), whistling-pine (English), filao (French), casuarina (English), pin d'Australie (French), coast she-oak (English), Eisenholz (German), Strandkasuarine (German), ironwood (English), bois de fer (French), horsetailtree (English), Australian-pine (English), pinheiro-da-Austrália (Portuguese)

**Synonym** *Casuarina litorea* , L. var. *litorea*  
*Casuarina littorea* , L. ex Fosberg & Sachet  
*Casuarina litorea* , Rumpheus ex Stickman

**Similar species** *Casuarina glauca*, *Casuarina cunninghamiana*

**Summary** *Casuarina equisetifolia* is an evergreen conifer-like angiosperm. It has been introduced to new locations for coastal landscaping and erosion control. It has become invasive in Florida (USA) where it interferes with prime reptile nesting sites. *Casuarina* aggressively colonizes sandy beaches where it forms monocultures and degrades habitat in the Cayman Islands.



[view this species on IUCN Red List](#)

## Species Description

*Casuarina equisetifolia* is a member of the Casuarinaceae (beefwood) family; it is an evergreen tree with a soft wispy pine-like appearance and an open irregular crown (FEPPC Undated). The tree can attain heights of up to 50 meters, with a diameter of up to 18 centimetres; however, it generally only reaches 15 to 25 meters in height (NRC US Advisory Committee on Technology Innovation 1980). It bears a resemblance to coniferous plants due to the production of cone-like fruits and pine-needle-like leaves.

It has reddish brown to grey bark; the bark is rough, brittle, peeling. Branchlets are pine-needle like, greyish green, jointed, thin (less than 1 millimetre wide), 10 to 20 centimetres (four to eight inches) long, minutely ridged, hairy in furrows. Leaves are reduced to tiny scales, six to eight in whorls (this is a distinguishing feature, see Similar Species), whorls encircle joints of branchlets. Flowers are unisexual/monoecious, inconspicuous, female in small axillary clusters, male in small terminal spikes. Fruit is a tiny, one-seeded, winged nutlet (samara), formed in woody cone-like clusters (fruiting heads), these clusters are brown, two-centimetre-long (3/4 inch) and 1.3 centimetre-wide (1/2 inch) (Description from FEPPC Undated).

## Notes

*Casuarina cunninghamiana* Miq. (River sheoak), *C. equisetifolia* L. (Australian pine) and *C. glauca* Seiber (gray sheoak) hybridise with each other (Morton 1980, in Snyder 1992; all three pose a threat to the environment and are considered invasive in the USA (Flores 2008).

There are two subspecies: *C. equisetifolia* var. *equisetifolia* and *C. equisetifolia* var. *incana* Benth; they differ in height and stem straightness, the latter has a smaller and poorer stem form and a more open canopy; many morphological features are variable (Binggeli 1997).

## Lifecycle Stages

Young seedlings are sensitive to drought, flood and fire. Growth is most rapid during the first 7 years. The minimum seed-bearing age is 4 to 5 years. Maximum growth is reached in 20 years with a maximum life span of 40 to 50 years (Elfers 1988, in Snyder 1992). In Florida, growth rates have ranged from 0.5 to 1.5 metres per year under stressed conditions and over 3 metres per year under cultivation.

## Uses

*Casuarina* is widely planted for coastal reclamation, erosion control, tannin, pulp, timber and fuel, the latter particularly in third world countries (Duke 1983; Elfers 1988). *Casuarina* was once used in the USA for reclaiming eroded areas, but many land managers condemn its use because it threatens indigenous plants and animals (Little & Skomen 1989, in Snyder 1992). Some African and Asian countries use it to combat desertification (Vietmeyer 1986, in Snyder 1992).

The wood is used for beams, boat building, electric poles, fences, furniture, mine props, oars, pavings, pilings, roofing shingles, tool handles, wagon wheels and yokes (Elfers 1988, Little & Skomen 1989, in Snyder 1992). Hill tribes of New Guinea use *Casuarina* in rotation to restore nitrogen to the soil. The leaves have been employed in preparing active carbon by the zinc chloride method. Minor uses include wood ash for making soap and the extraction of dye from its bark (Elfers 1988). *Casuarina* species have medicinal value; the astringent bark extract may be used as a remedy for diarrhea and dysentery and to help relieve a sore throat.

## Habitat Description

*Casuarina equisetifolia* occurs in open coastal strand habitats in subtropical and tropical climates, including: sandy and shelly beaches, rocky coasts, sand dunes, sand bars and estuarine/mangrove habitats (NRC US Advisory Committee on Technology Innovation 1980; Swearingen 1997; DaCosta-Cottam *et al.* 2009). Its natural habitat has been described as coastal herbaceous swamp and broad-leaved hammock communities (Binggeli 1997), however, *C. equisetifolia* frequently colonises disturbed sites such as filled wetlands, roadsides and cleared land (Elfers 1988).

This rapid-growing species will establish in habitats as varied as coastal sand dunes, high mountain slopes, the humid tropics and semiarid regions; it tends to be salt tolerant, wind resistant and adaptable to moderately poor solids; although it is not a legume it does have the ability to form root nodules with microbial associations and fix atmospheric nitrogen (NRC US Advisory Committee on Technology Innovation 1980; Little & Skomen 1989, in Snyder 1992).

The monthly mean maximum temperature in the native area of *Casuarina* is 10°C to 33°C and it is reported to prefer annual temperatures of 22°C to 27°C; it is not frost-hardy (NRC US Advisory Committee on Technology Innovation 1980; Duke 1983; Snyder 1992). This lowland species grows from sea level up to 1 500 meters; in its natural habitat rainfall is from 700 to 2 000 millimetres, often with a dry season of six to eight months; however, it is reported to tolerate an annual precipitation of 640 to 4 300 millimetres (NRC US Advisory Committee on Technology Innovation 1980; Duke 1983).

This species tolerates calcareous (limestone-derived) and slightly saline soils with a pH of between 5.0 and 7.7 but it grows poorly on heavy soils such as clays; it can withstand partial water-logging for a time (NRC US Advisory Committee on Technology Innovation 1980; Duke 1983). It is reported to prefer coarse-textured soils (Rockwood *et al.* undated) and is very tolerant of saline conditions and salt spray (Elfers 1988).

## Reproduction

*Casuarina equisetifolia* produces thousands of wind-dispersed winged seeds per plant and resprouts profusely following coppicing (Elfers 1988). A single four or five year-old tree can produce thousands of seeds (Elfers 1988). Seeds in the seed bank can remain fertile for a few months to a year and germinate under conditions of adequate moisture and porous soil in four to eight days (Snyder 1992).

*C. equisetifolia* flowers and fruits year-round in warm climates (Elfers 1988, in Snyder 1992). In the USA *C. equisetifolia* usually flowers and fruits twice a year: between February and April, and September and October, producing fruit in June and December. In Hawaii and Puerto Rico flowering and fruiting times are irregular (Binggeli 1997).

## Nutrition

*Casuarina equisetifolia* can tolerate low soil fertility but is quite responsive to fertilisation with phosphorus or nitrogen and phosphorus (Rockwood *et al.* UNDATED).

## General Impacts

*Casuarina equisetifolia* is a fast-growing plant which produces heavy shade and a thick blanket of leaves and fruits beneath it, reducing habitat value (Florida DEP Undated). Its dense monoculture thickets displace native dune and beach plant species. Once established, *C. equisetifolia* alters light, temperature, soil chemistry and hydrology of the habitats it invades.

Habitat alteration: The thick layer of leaves produced by *C. equisetifolia* has a reduced food value for native wildlife and destroys habitat for native insects and other wildlife (Klukas 1969, in Snyder 1992).

Reduction in native biodiversity: *C. equisetifolia* forests provide little or no native wildlife habitat. In the Everglades, where *C. equisetifolia* has invaded south Florida's hammock and tree island communities, Mazzotti Ostrenko and Smith (1981) studied the effects of *Melaleuca quinquenervia* and *C. equisetifolia* on three native rodents (*Peromyscus gossypinus*, *Sigmodon hispidus* and *Oryzomys palustris*). The authors found that *Casuarina* habitats supported fewer rodents than either cocoplum or *Melaleuca* habitats.

Threat to endangered species: *C. equisetifolia* displaces native beach vegetation that provide critical wildlife habitat for threatened and endangered plant and animal species. *C. equisetifolia* forms dense stands and destroys reptile breeding sites in the Everglades National Park. Its presence threatens the only remaining nesting areas in the USA of the 'Vulnerable (VU) American crocodile (*Crocodylus acutus*) and one of the remaining most productive nesting areas of the 'Endangered (EN)' loggerhead turtle (*Caretta caretta* ssp. *caretta*) and the 'Endangered (EN)' green turtle (*Chelonia mydas*) (Binggeli 1997; Klukas 1969 1973, in USDA Forest Service 2007). The nest sites of these species are threatened as the invasive plant takes over beach dune habitat and baby sea turtles become trapped in its roots as they emerge from their nests (Florida DEP Undated). Areas inhabited by the 'Vulnerable (VU) gopher tortoise (*Gopherus polyphemus*) are also threatened with invasion by *Casuarina* (Mazzotti Ostrenko and Smith 1981).

Modification of hydrology: *C. equisetifolia* can exhaust the moisture in the soil and lower the water table of the area (NRC US Advisory Committee on Technology Innovation 1980) it invades.

Physical disturbance: *C. equisetifolia* can facilitate beach erosion by displacing deep-rooted vegetation (Florida DEP Undated). Unlike native vegetation *C. equisetifolia* has a shallow root system and tends to uproot and topple during high winds, posing a significant hazard to coastal storm evacuation routes (Florida DEP Undated). Its dense roots can also break water-lines and sewer-lines (Snyder 1992).

Inhibits the growth of other species: *C. equisetifolia* produces allelopathic compounds that inhibit growth of other plants (Morton 1980, in Florida DEP Undated).

Modification of successional patterns: *C. equisetifolia* can be a primary or secondary coloniser in disturbed areas in Florida, USA (Elfers 1988, Klukas 1969, in Snyder 1992).

Human health: The genus *Casuarina* poses a problem to humans as its pollen is a source of respiratory irritation and allergies (Elfers 1988; Binggeli 1997).

## Management Info

**Preventative measures:** A [Risk Assessment of \*C. equisetifolia\*](#) for Hawaii and other Pacific islands was prepared in 2008. The result is a score of 21 placing it in the High Risk category and concluding that it is *"likely to cause significant ecological or economic harm in Hawaii and on other Pacific Islands"*.

**Physical:** For small infestations the manual removal of seedlings and saplings is recommended (Swearingen 1997); however, it should be noted that cutting often induces sprouting (Snyder 1992).

Prescribed fire has been used for large infestations in fire-tolerant vegetation communities. Fire control is reported to be effective in dense stands with sufficient dry fuel on the ground. Periodic fires coupled with the use of herbicides may be an effective method of controlling *Casuarina* (Snyder 1992). However, too frequent intense fires that kill over story native pines may actually encourage *Casuarina* species to establish (Wade Ewel & Hofstetter 1980, in Snyder 1992). Burning *Casuarina* in peat soils may be hazardous (Morton 1980, in Snyder 1992). Fire may be an effective control method for trees greater than eight centimetres (three inches) in diameter and in dense stands; burning could be potentially harmful if the soil pH is changed such that native species cannot establish (Elfers 1988, in Snyder 1992).

**Chemical:** For heavier infestations application of a systemic herbicide to bark, cut stumps or foliage is likely to be most effective. Chemicals such as 2,4,5-T, 2,4-D or Garlon 3A can be used to tackle *Casuarina* (Klukas 1969, Morton 1980, in Snyder 1992). A 2% mixture of Garlon 4 in diesel oil applied using the basal bark method or the hack-and-squirt method is most commonly used against *Casuarina* in the USA (US Exotic Pest Plant Council Undated). Garlon 3A is also effective.

**Biological:** USDA Agricultural Research Service (ARS) scientists have been searching in Australia's outback and coastlines for insects that could be key bio-controls for *C. equisetifolia* (Flores 2008). From 300 species, including wasps, weevils, stem-borers, sap-suckers and seed-eaters about 12 candidates have been identified. Not only do these agents attack *C. equisetifolia* but many also attack the related invasives *C. glauca* and *C. cunninghamiana*. The most promising bio-control agents include the seed-feeding wasp (*Bootanellus orientalis*), which is host-specific to Australian pine, and the defoliator moth (*Zauclophora pelodes*). These insects are still undergoing testing to determine their suitability for use as bio-control agents in the United States. Please follow this link to read more about this research in the September 2008 issue of Agricultural Research magazine.

Many pathogens threaten plantations of *Casuarina* in many parts of the world. In India a stem borer kills shoots and seedling damping-off by *Rhizoctonia* spp. occurs in nurseries (Binggeli 1997). Nursery seedlings in India are attacked by various insect species. In China the lymantriid moth (*Lymantria xyliana*) is described as one of the worst pests of *C. equisetifolia* (Elfers 1988).

In Florida, USA, there has been a high rate of root rot caused by the fungus *Clitocybe tabescens*. In Puerto Rico stem canker and dieback attributable to the fungus *Diplodia natalensis* have been recorded on *C. equisetifolia*. In Puerto Rico natural regeneration is rare because ants eat nearly all the seeds (Binggeli 1997). Ants have also reportedly been a major source of control in India.

**Integrated Pest Management:** Recently disturbed beach habitat may be planted with native vegetation to prevent *C. equisetifolia* from invading.

## Pathway

Seven Australian and one East Indian species of the genus *Casuarina* were introduced into the United States before 1924, beginning with seeds brought from France in 1898 by the U.S. Dept. of Agriculture explorer, Dr. W. T. Swingle. Some seeds were distributed under erroneous names and problems of misidentification have continued since (Elfers 1988). *C. equisetifolia* was introduced into Florida in the late 1800s, planted widely for the ditch and canal stabilization, shade and timber (Swearingen 1997).

**Principal source:** Elfers, S. C. 1988. Element Stewardship Abstract for *Casuarina equisetifolia* The Nature Conservancy

[Swearingen, J. M. 1997. Australian Pine. Washington, D.C. National Park Service, Plant Conservation Alliance, Alien Plant Working Group](#)  
[Pacific Islands Ecosystems at Risk, \(PIER\), 2010 \*Casuarina equisetifolia\* L.](#)

**Compiler:** National Biological Information Infrastructure (NBII) & IUCN/SSC Invasive Species Specialist Group (ISSG)

Updates under progress with support from the Overseas Territories Environmental Programme (OTEP) project XOT603, a joint project with the Cayman Islands Government - Department of Environment

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**Publication date:** 2010-01-23

## ALIEN RANGE

|   |   |
|---|---|
| <b>[1]</b> ANGUILLA                                       | <b>[1]</b> ANTIGUA AND BARBUDA                  |
| <b>[2]</b> ATLANTIC - WESTERN CENTRAL                     | <b>[1]</b> AUSTRALIA                            |
| <b>[1]</b> BAHAMAS  | <b>[1]</b> BERMUDA                              |
| <b>[1]</b> BES ISLANDS (BONAIRE, SINT EUSTATIUS AND SABA) | <b>[1]</b> CAROLINE ISLANDS                     |
| <b>[4]</b> CAYMAN ISLANDS                                 | <b>[1]</b> COOK ISLANDS                         |
| <b>[1]</b> CUBA   | <b>[1]</b> DOMINICA                             |
| <b>[1]</b> DOMINICAN REPUBLIC                             | <b>[1]</b> ECUADOR                              |
| <b>[1]</b> FRENCH POLYNESIA                               | <b>[1]</b> GRENADA                              |
| <b>[1]</b> GUADELOUPE                                     | <b>[1]</b> GUAM                                 |
| <b>[1]</b> HAITI  | <b>[1]</b> JAMAICA                              |
| <b>[1]</b> KIRIBATI                                       | <b>[1]</b> MARSHALL ISLANDS                     |
| <b>[1]</b> MARTINIQUE                                     | <b>[1]</b> MEXICO                               |
| <b>[1]</b> MONTSERRAT                                     | <b>[1]</b> NAURU                                |
| <b>[1]</b> NORTHERN MARIANA ISLANDS                       | <b>[1]</b> PAKISTAN                             |
| <b>[1]</b> PALAU  | <b>[1]</b> PITCAIRN                             |
| <b>[1]</b> PUERTO RICO                                    | <b>[1]</b> REUNION                              |
| <b>[2]</b> SAINT HELENA                                   | <b>[1]</b> SAINT KITTS AND NEVIS                |
| <b>[1]</b> SAINT LUCIA                                    | <b>[1]</b> SAINT VINCENT AND THE GRENADINES     |
| <b>[1]</b> SAMOA  | <b>[1]</b> TONGA                                |
| <b>[1]</b> TRINIDAD AND TOBAGO                            | <b>[1]</b> TURKS AND CAICOS ISLANDS             |
| <b>[3]</b> UNITED STATES                                  | <b>[1]</b> UNITED STATES MINOR OUTLYING ISLANDS |
| <b>[2]</b> VIRGIN ISLANDS, BRITISH                        | <b>[1]</b> VIRGIN ISLANDS, U.S.                 |

**Red List assessed species 8: CR = 5; EN = 1; VU = 2;**

[Acacia anegadensis](#) **CR**

[Chamaesyce deppeana](#) **CR**

[Crocodylus acutus](#) **VU**

[Juniperus bermudiana](#) **CR**

[Caretta caretta](#) **EN**

[Cordia rupicola](#) **CR**

[Gopherus polyphemus](#) **VU**

[Metastelma anegadense](#) **CR**

## BIBLIOGRAPHY

**38 references found for *Casuarina equisetifolia***

### Management information

[Binggeli P. 1997 \*Casuarina equisetifolia\* L. \(Casuarinaceae\). \*Woody Plant Ecology\*.](#)

**Summary:** Short summary of description, synonyms, uses and reproductive biology.

DaCosta-Cottam, M., Olynik, J., Blumenthal, J., Godbeer, K.D., Gibb, J., Bothwell, J., Burton, F.J., Bradley, P.E., Band, A., Austin, T., Bush, P., Johnson, B.J., Hurlston, L., Bishop, L., McCoy, C., Parsons, G., Kirkconnell, J., Halford, S. and Ebanks-Petrie, G. 2009. *Cayman Islands National Biodiversity Action Plan 2009*. Cayman Islands Government. Department of Environment.

Daehler, C.C.; Denslow, J.S.; Ansari, S and Huang-Chi, K., 2004. A Risk-Assessment System for Screening Out Invasive Pest Plants from Hawaii and Other Pacific Islands. *Conservation Biology* Volume 18 Issue 2 Page 360.

**Summary:** A study on the use of a screening system to assess proposed plant introductions to Hawaii or other Pacific Islands and to identify high-risk species used in horticulture and forestry which would greatly reduce future pest-plant problems and allow entry of most nonpests.



Darwin Initiative. Undated a. In *Ivan's Wake: Darwin Initiative Biodiversity Action Plan for the Cayman Islands (October 2005 - October 2008) > Project Outputs > Habitat Mapping: > Coastal*

**Summary:** Available from: <http://www.seaturtle.org/mtrg/projects/cayman/COASTAL%20HABITATS%20MAPS.pdf> [Accessed 23 October 2009]

Darwin Initiative. Undated b. In *Ivan's Wake: Darwin Initiative Biodiversity Action Plan for the Cayman Islands (October 2005 - October 2008) > Project Outputs*

**Summary:** Available from: <http://www.seaturtle.org/mtrg/projects/cayman/outputs.shtml> [Accessed 23 October 2009]

Elfers, S. C. 1988. *Element Stewardship Abstract for Casuarina equisetifolia*. The Nature Conservancy.

European and Mediterranean Plant Protection Organization (EPPO), 2006. *Guidelines for the management of invasive alien plants or potentially invasive alien plants which are intended for import or have been intentionally imported*. EPPO Bulletin 36 (3), 417-418.

Flores, A. 2008. *ARS Researchers Search for Casuarina Biological Control Agents*. USDA-ARS (United States Department of Agriculture - Agricultural Research Service).

**Summary:** Available from: <http://www.ars.usda.gov/is/pr/2008/080902.htm> [Accessed 11 November 2009]

Florida DEP (Florida Department of Environmental Protection) - Bureau of Invasive Plant Management. Undated. *Weed Alert: Australian pine (Casuarina species)*.

**Summary:** Available from: [http://www.fleppc.org/Weed\\_Alerts.htm](http://www.fleppc.org/Weed_Alerts.htm) [Accessed 11 November 2009]

IUCN 2010. *IUCN Red List of Threatened Species. Version 2010.4*.

**Summary:** The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information on taxa that have been globally evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those taxa that are facing a higher risk of global extinction (i.e. those listed as Critically Endangered, Endangered and Vulnerable). The IUCN Red List also includes information on taxa that are categorized as Extinct or Extinct in the Wild; on taxa that cannot be evaluated because of insufficient information (i.e. are Data Deficient); and on taxa that are either close to meeting the threatened thresholds or that would be threatened were it not for an ongoing taxon-specific conservation programme (i.e. are Near Threatened).

Available from: <http://www.iucnredlist.org/> [Accessed 25 May 2011]

IUCN/SSC Invasive Species Specialist Group (ISSG), 2010. *A Compilation of Information Sources for Conservation Managers*.

**Summary:** This compilation of information sources can be sorted on keywords for example: Baits & Lures, Non Target Species, Eradication, Monitoring, Risk Assessment, Weeds, Herbicides etc. This compilation is at present in Excel format, this will be web-enabled as a searchable database shortly. This version of the database has been developed by the IUCN SSC ISSG as part of an Overseas Territories Environmental Programme funded project XOT603 in partnership with the Cayman Islands Government - Department of Environment. The compilation is a work under progress, the ISSG will manage, maintain and enhance the database with current and newly published information, reports, journal articles etc.

Kueffer, C. and Mauremootoo, J., 2004. Case Studies on the Status of Invasive Woody Plant Species in the Western Indian Ocean. 3. Mauritius (Islands of Mauritius and Rodrigues). Forest Health & Biosecurity Working Papers FBS/4-3E. Forestry Department, Food and Agriculture Organization of the United Nations, Rome, Italy.

Mack, R. N and W. M. Lonsdale., 2002. *Eradicating invasive plants: Hard-won lessons for islands*. In *Turning the tide: the eradication of invasive species*: 311-318. Veitch, C.R. and Clout, M.N.(eds). IUCN SSC Invasive Species Specialist Group. IUCN. Gland. Switzerland and Cambridge. UK.

**Summary:** Uses *Clidemia hirta* in Hawaii as an eradication case study. *Clidemia* is in the Melastomataceae and somewhat similar ecologically to *miconia*.

Eradication case study in *Turning the tide: the eradication of invasive species*.

National Research Council United States (NRC US) Advisory Committee on Technology Innovation. 1980. *Firewood crops: shrub and tree species for energy production : report of an ad hoc panel of the Advisory Committee on Technology Innovation, Board on Science and Technology for International Development, Commission on International Relations, Volume 2*. National Academies.

PIER (Pacific Island Ecosystems at Risk), 2010. *Casuarina equisetifolia*

**Summary:** Ecology, synonyms, common names, distributions (Pacific as well as global), management and impact information.

Available from: [http://www.hear.org/pier/species/casuarina\\_equisetifolia.htm](http://www.hear.org/pier/species/casuarina_equisetifolia.htm)

Rentería, Jorge Luis; Rachel Atkinson, Ana Mireya Guerrero, Johanna Mader 2006. *Manual de Identificación y Manejo de Malezas en las Islas Galápagos. Segunda edición*. Fundación Charles Darwin. Santa Cruz, Galápagos, Ecuador.

**Summary:** An illustrated guide providing practical information for the effective control of the worst invasive plant species in Galapagos. Designed for farmers and other land managers, it describes manual and chemical control methods. It also includes 8 species that are potential problems for Galapagos. Language: Spanish

Una guía con ilustraciones que provee información para el control efectivo de las peores plantas invasoras en Galápagos. Esta diseñada para los agricultores y personas involucradas en conservación. De una forma clara y simple se describe los métodos de control manuales y químicos; también incluye 8 especies que potencialmente podrían ser un problema para Galápagos. Lenguaje: Español.

[Rentería, Jorge Luis; Rachel Atkinson & Chris Buddenhagen., 2007. Estrategias para la erradicación de 21 especies de plantas. Fundación Charles Darwin, Departamento de Botánica. Programa de Especies Invasoras en Galápagos potencialmente invasoras en Galápagos.](#)

**Summary:** This document comprises costed eradication plans for 21 invasive species in Galapagos. The plans were developed as part of a GEF funded project ECU/00/G31 Control of Invasive species in the Galapagos Archipelago. The management plans report projects at different stages of development and for species that have invaded to different extents. Three of the projects have already been finished successfully, 5 have yet to be started, and for the rest the projects have been running for between 1 and 6 years. The cost and time needed for eradication varies considerably by species and demonstrates the importance of species eradication as soon as possible after detection

Resumen

El presente documento proporciona planes de manejo y el costo para la erradicación de 21 especies que se encuentran presentes en Galápagos. Los planes fueron desarrollados como parte del proyecto ECU/00/G31 Control de las especies invasoras en el Archipiélago de las Galápagos, suscrito por el Gobierno Ecuatoriano, representado por el Ministerio del Ambiente, con el Fondo para el Medio Ambiente Mundial (GEF). El Proyecto es implementado por el Programa de las Naciones Unidas para el Desarrollo (UNDP), tiene como instituciones ejecutoras al Servicio Parque Nacional Galápagos (SPNG), Instituto Nacional Galápagos (INGALA), Servicio Ecuatoriano de Sanidad Agropecuaria-Galápagos (SESA-Galápagos), y Fundación Charles Darwin (FCD). Los planes de manejo representan proyectos en diferentes estados de desarrollo y dimensión. Tres de estos proyectos ya han sido desarrollados completamente, trece están en proceso y cinco aún no se han iniciado. El costo y tiempo para la erradicación varía considerablemente según la especie y se muestra la importancia económica que implica desarrollar proyectos de erradicación tan pronto las especies son detectadas.

[Swearingen, J. M. 1997. Australian Pine. Washington, D.C.: National Park Service, Plant Conservation Alliance, Alien Plant Working Group.](#)

**Summary:** Detailed report on description, distribution, habitat, reproduction methods and management.

[Varnham, K. 2006. Non-native species in UK Overseas Territories: a review. JNCC Report 372. Peterborough: United Kingdom.](#)

**Summary:** This database compiles information on alien species from British Overseas Territories.

Available from: <http://www.jncc.gov.uk/page-3660> [Accessed 10 November 2009]

## General information

[CONABIO. 2008. Sistema de información sobre especies invasoras en México. Especies invasoras - Plantas. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad. Fecha de acceso.](#)

**Summary:** English:

The species list sheet for the Mexican information system on invasive species currently provides information related to Scientific names, family, group and common names, as well as habitat, status of invasion in Mexico, pathways of introduction and links to other specialised websites. Some of the higher risk species already have a direct link to the alert page. It is important to notice that these lists are constantly being updated, please refer to the main page (<http://www.conabio.gob.mx/invasoras/index.php/Portada>), under the section Novedades for information on updates.

Invasive species - Plants is available from: [http://www.conabio.gob.mx/invasoras/index.php/Especies\\_invasoras\\_-\\_Plantas](http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Plantas) [Accessed 30 July 2008]

Spanish:

La lista de especies del Sistema de información sobre especies invasoras de México cuenta actualmente con información acerca de nombre científico, familia, grupo y nombre común, así como hábitat, estado de la invasión en México, rutas de introducción y ligas a otros sitios especializados. Algunas de las especies de mayor riesgo ya tienen una liga directa a la página de alertas. Es importante resaltar que estas listas se encuentran en constante proceso de actualización, por favor consulte la portada (<http://www.conabio.gob.mx/invasoras/index.php/Portada>), en la sección novedades, para conocer los cambios.

Especies invasoras - Plantas is available from: [http://www.conabio.gob.mx/invasoras/index.php/Especies\\_invasoras\\_-\\_Plantas](http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Plantas) [Accessed 30 July 2008]

[Conservatoire Botanique National De Mascarin \(BOULLET V. coord.\) 2007. - Casuarina equisetifolia Index de la flore vasculaire de la Réunion \(Trachophytes\) : statuts, menaces et protections. - Version 2007.1](#)

**Summary:** Base de données sur la flore de la Réunion. De nombreuses informations très utiles.

Available from: <http://flore.cbnm.org/index2.php?page=taxon&num=30c8e1ca872524fbf7ea5c519ca397ee> [Accessed 26 March 2008]

[Duke J. A., 1983 Casuarina equisetifolia J.R. & G. Forst., Center for New Crops & Plant Products, Purdue University.](#)

**Summary:** Detailed report on description, distribution, habitat, uses and management.

[Florida Exotic Pest Plant Council \(FEPPC\). Undated. Casuarina equisetifolia L.](#)

**Summary:** Available from: [http://www.fleppc.org/ID\\_book/Casuarina%20equisetifolia.pdf](http://www.fleppc.org/ID_book/Casuarina%20equisetifolia.pdf) [Accessed 11 November 2009]

Francis, J.K. and Liogier, H.A. 1991. Naturalized exotic tree species in Puerto Rico, *General Technical Report SO-82*. New Orleans, LA: US Department of Agriculture, Forest Service, Southern Forest Experiment Station. 12 pp.

[ITIS \(Integrated Taxonomic Information System\), 2004. Online Database Casuarina equisetifolia](#)

**Summary:** An online database that provides taxonomic information, common names, synonyms and geographical jurisdiction of a species. In addition links are provided to retrieve biological records and collection information from the Global Biodiversity Information Facility (GBIF) Data Portal and bioscience articles from BioOne journals.

Available from: [http://www.itis.gov/servlet/SingleRpt/SingleRpt?search\\_topic=TSN&search\\_value=19516](http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=19516) [Accessed December 31 2004]

[Langeland, K.A. and Burks, K. C \(Eds\) 1998. Identification and Biology of Non-Native Plants in Florida's Natural Areas, University of Florida. Casuarina equisetifolia.](#)

**Summary:** Information on plants that pose threats to natural resource areas in Florida.

Available from: [http://www.fleppc.org/ID\\_book/Casuarina%20equisetifolia.pdf](http://www.fleppc.org/ID_book/Casuarina%20equisetifolia.pdf) [Accessed 10 June 2003]

Macdonald, I.A.W., Thibaud, C., Strahm, W.A., & Strasberg, D. 1991. Effects on alien plant invasions on native vegetation remnants on La Reunion (Mascarene Islands, Indian Ocean). *Environmental Conservation*, 18, 51-61.

**Summary:** Cet article est le premier à proposer une hiérarchisation des plantes les plus envahissantes de La Réunion. 33 plantes ont été ainsi classées en utilisant une méthode développée en Afrique du Sud. Les bases d'une stratégie de lutte contre les plantes exotiques envahissantes sont également formulées.

Meyer, J.-Y. 2000. Invasive plants in the Pacific Islands. In: *The Invasive Species in the Pacific: A Technical Review and Draft Regional Strategy*. Sherley, G. (tech. ed). Published in June 2000 by the South Pacific Regional Environment Programme (SPREP).

**Summary:** Resource that includes the distribution of invasive species throughout the Pacific Islands.

Meyer, J.-Y 2007a. Rapport de mission à Moruroa. Mise au point de méthodes de lutte contre le *aito* (*Casuarina equisetifolia*).

Délimitation de la Recherche. 16p + annexes

Meyer, J.-Y 2007b. Rapport de mission à Moruroa. Suivi des traitements de lutte contre le *aito* (*Casuarina equisetifolia*) et inventaire de la flore primaire et secondaire à l'atoll. Délimitation de la Recherche. 16p + annexes

Rentería, J.L., R. Atkinson & C. Buddenhagen. 2007. *Estrategias para la erradicación de 21 especies de plantas potencialmente invasoras en Galápagos*. Fundación Charles Darwin.

**Summary:** Text in Spanish.

Rockwood, Fisher, Conde and Huffman. [Undated]. *Casuarina L. ex Adans: Casuarina*. USDA Forest Service St. Paul Field Office, Minnesota

**Summary:** A report on description, distribution, habitat, reproduction methods, and uses.

Snyder, S. A. 1992. *Casuarina* spp. In: *Fire Effects Information System*, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/>

**Summary:** Available from: <http://www.fs.fed.us/database/feis/> [Accessed 11 November 2009]

Snyder S. A. 1992. SPECIES: *Casuarina* spp., U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, *Fire Effects Information System*, [Online].

**Summary:** Report on ecology, biology, synonyms, common names and habitat information

Tassin, J., Rivière, J.N., Cazanove, M., Bruzese, E. 2006. Ranking of invasive woody plant species for management on Réunion Island.

Weed research 46, 388-403

**Summary:** L'inventaire de 318 espèces de plantes ligneuses introduites à la Réunion, permet d'en identifier 132 comme naturalisées dans les écosystèmes naturels. 26 de ces espèces choisies parmi les plus envahissantes ont été classées en fonction de leur impact biologique sur les écosystèmes indigènes.

USDA-ARS (United States Department of Agriculture - Agricultural Research Service). 2008. *In Search of Biological Control Agents for the Invasive Australian Pine*.

**Summary:** Available from: <http://www.ars.usda.gov/is/AR/archive/sep08/pine0908.htm> [Accessed 11 November 2009]

USDA-GRIN (Germplasm Resources Information Network). 2004. *Casuarina equisetifolia*. National Genetic Resources Program [Online Database] National Germplasm Resources Laboratory, Beltsville, Maryland.

**Summary:** Information on common names, synonyms, and the distributional range of species.

Available from: <http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?9553> [Accessed 20 January 2004]

USDA-NRCS. 2004. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

**Summary:** The PLANTS Database provides standardized information about the vascular plants, mosses, liverworts, hornworts, and lichens of the U.S. and its territories. It includes names, plant symbols, checklists, distributional data, species abstracts, characteristics, images, plant links, references, crop information, and automated tools.

Available from: [http://plants.usda.gov/cgi\\_bin/topics.cgi?earl=plant\\_profile.cgi&symbol=CAEQ](http://plants.usda.gov/cgi_bin/topics.cgi?earl=plant_profile.cgi&symbol=CAEQ)